Mars Global Surveyor

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Mapping Orbit Update: Extra 1 km & Complete Cycle Elements

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MO / MGS 1 km DISCREPANCY

- MO MAPPING ORBIT BASED ON BALMINO 18x18 GRAVITY FIELD
  - OSCULATING ELEMENTS AT PERIAPSIS*
    a = 3765.858 km, e = 0.00344579, i = 92.951°
  - TIMING/LONGITUDE ERRORS MINIMIZED AT REV 328 (1 MAPPING CYCLE)
- SALAMA / KANGAS MGS GROUNDTRACK ANALYSIS NOTED PROBLEM
  - 1995 STUDY OF GROUNDTRACK COVERAGE, DRAG EFFECTS
  - STARTED WITH MO MAPPING ELEMENTS
  - FOUND MO ORBIT DID NOT HAVE ENOUGH WESTWARD DRIFT
    - REV 328 NODE ~200 km EAST OF IDEAL
  - ADDED 1 km TO a FOR BETTER DRIFT, CONTINUED STUDY
- ANALYZED MO ORBIT WITH NEW MGS TOOLS
  - VERIFIED SALAMA/KANGAS RESULTS - REV 328 NODE 170 km EAST
  - "REFROZE" MO ORBIT USING BALMINO FIELD AND Mars50c
    - REQUIRED SEMIMAJOR AXIS IS 0.7 km HIGHER

*MO Trajectory Characteristics Document (Final), p. 5-8; Bass, "Mapping Orbit Grid Deviation", 312/90.2-1595, 9 March 1990

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MO / MGS 1 km DISCREPANCY

- Results

Case	Model	a	e	i
MO TCD	Balmino 18x18	3765.858	0.003446	92.951
Refreeze	Balmino 18x18	3766.553	0.003624	92.892
Refreeze	Mars50c 18x18	3766.595	0.005665	92.953

- Conclusion: MO mapping elements in error

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MGS ELEMENTS FOR 6917 REVS

- MGS MAPPING ORBIT PRESENTED 4/26/96 MINIMIZED NODE ERRORS AT REV 655
- COULD NOT TRY FULL 6917 REV CASE DUE TO DPTARJ LIMITATION

- UPDATED VERSION OF DPTRAJ ALLOWS FULL 6917 REV CASE
  - ORIGINAL ELEMENTS RESULT IN 5 KM NODE ERROR AT REV 6917
  - NEW ELEMENTS KEEP NODE ERRORS TO $\pm$2 km THROUGHOUT CYCLE
  - OSCULATING ELEMENTS
    - a = 3765.940 km (1 m higher)
    - e = 0.00633835 (same)
    - i = 93.014° (0.047° higher)
  - MEAN ELEMENTS
    - Δa = 0.5 m
    - Δi = 0.0002°